The Virtuous Loop of AI and Games

@yannakakis
Games advancing

advancing

AI

advancing
Making **computers** able to do things which currently only **humans** can do **in games**
What do humans do in games?
Is the AI playing to win?

Is the AI taking the role of a human player?
Trivedi, Liapis and Yannakakis, Contrastive Learning of Generalized Game Representations, *IEEE Conference on Games*, 2021
Trivedi, Liapis and Yannakakis, Contrastive Learning of Generalized Game Representations, *IEEE Conference on Games*, 2021
Design
Grace, are you angry at Trip?
A user can select among a predefined set of map sizes. Map size determines the number of allowed bases and resources.

Gravina, Khalifa, Liapis, Togelius, Yannakakis, “Procedural content generation through quality diversity”, *IEEE Conference on Games*, 2019

**Weapon 1: The Minelayer**
Volz et al. Capturing Local and Global Patterns in Procedural Content Generation via Machine Learning, IEEE CoG, 2020
Karavolos, Liapis, and Yannakakis: “A Multi-Faceted Surrogate Model for Search-based Procedural Content Generation,” *IEEE Transactions on Games*, 2019
Experience
Is X or Y more frustrating?

- [X] X
- [ ] Y
- [ ] Both are equally frustrating
- [ ] Neither is frustrating

Gravina, Melhart, Yannakakis Moment-to-moment Engagement Prediction through the Eyes of the Observer: PUBG Streaming on Twitch, In Proc. of FDG, 2020
AGAIN Dataset
Affect Game Annotation
arXiv:2104.02643

Currently
• 124 participants
• 1,100+ gameplays
• 37+ hours of annotated videos
Melhart, Liapis and Yannakakis
Towards General Models of Player Experience: A Study Within Genres,
IEEE Conference on Games, 2021
Barthet, Liapis and Yannakakis, *Go-Blend Behaviour with Affect*, *Proc. of ACII*, 2021
Beyond Games?
Liu, Snodgrass, Khalifa, Risi, Yannakakis, Togelius, “Deep learning for procedural content generation” Neural Computing and Applications, 2020
Xylakis, Liapis and Yannakakis, *Architectural Form and Affect: A Spatiotemporal Study of Arousal* 
In *Proc. of Affective Computing and Intelligent Interaction*, 2021
The algorithm is initialized by a design collection created by an urban generative model, developed in GH using the DecodingSpaces Toolbox.

Gravina, Khalifa, Liapis, Togelius, Yannakakis, “Procedural content generation through quality diversity”, IEEE Conference on Games, 2019
Semantic-driven affect-based painting generation
The Game-AI Co-Revolution

Camilleri et al., *Platformer Level Design for Player Believability*, *IEEE CIG*, 2016.

Games... ...the final frontier for AI
AI... ...the final frontier for Games
Thank you!

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Thank you!
gameaibook.org and school.gameaibook.org